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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/363,191
Filing Date: July 29, 1999
Appellant(s): KOFUJI ET AL.

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GROUP 1700

John R. Mattingly
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 1/6/06 appealing from the Office action
mailed 12/6/04.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is substantially correct. The invention is directed to a dry etching apparatus for treating a body comprising: a chamber; a sample holder in said chamber designated to hold a wafer with a predetermined diameter; means for introducing gas into the chamber; means for exhausting the gas in the chamber; a power supply of Ultra High Frequency; an electromagnetic wave radiation antenna coupled to the power supply and installed in an

atmosphere; and a separation plate used as dielectric between the antenna and the inside of the chamber, wherein the antenna is a plate antenna including a discoidal electrode to which Ultra High Frequency is applied, and earth electrode and a dielectric plate provided between the discoidal electrode and the earth electrode, wherein a diameter of the discoidal electrode is not less than that of the wafer, as required by independent claim 1. Also the invention is directed to a dry etching apparatus for treating a semiconductor wafer comprising: a chamber; a holder in the chamber designated to receive a semiconductor wafer of a predetermined diameter; means for exhausting said gas in the chamber; means for introducing gas into the chamber; a power supply of Ultra High Frequency; a plate antenna for radiating an electromagnetic wave, coupled to the power supply and installed in an atmosphere, the microstrip antenna comprising a discoidal electrode; and a separation plate used as a dielectric between the antenna and the inside of the chamber; wherein the plate antennae is including a discoidal electrode to which Ultra High Frequency is applied, an earth electrode and a dielectric plate provided between the discoidal electrode and the earth electrode, wherein a diameter of the discoidal electrode is not less than that of the wafer, as required by independent claim 34.

Furthermore, the invention is directed to the dry etching apparatus of claim 1, wherein the separation plate separates the chamber and a second area where the pressure is higher than the pressure in the chamber, the antenna is a microstrip antenna formed in the second area, a coil outside the chamber and wherein the plate antenna resonates TM₀₁ mode, as claimed in dependent claim 8.

Additionally, dependent claims 37 and 38, require that the dry etching apparatus of claim 1 or claim 34, respectively, further comprise: a conical-shaped feed division to provide Ultra High Frequency power to the plate antenna, wherein said conical-shaped feed division is placed on the discoidal electrode, and the feed division is placed in the atmosphere.

Also, dependent claims 39 and 40, require that the dry etching apparatus of claim 1 or claim 34, respectively, further comprise: a gas shower plate which its diameter is less than or equal to three fourths of the diameter of the wafer.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 6,155,202	NAKANO ET AL.	12-2000
US 6,009,830	LI ET AL.	01-2000
US 5,614,055	FAIRBAIRN ET AL.	03-1997
EP 0779644	YOKOGAWA ET AL.	06-1997

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-2, 4, 6, 8-9, 34-38 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification as originally filed fails to provide support for instant claimed invention of a dry etching apparatus wherein the antenna includes a discoidal electrode to which Ultra High Frequency is applied, an earth electrode and a dielectric plate provided between the discoidal electrode and the earth electrode.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-2, 4, 6, 8 and 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., EP 0,779,644 A2.

Yokogawa et al. shows the invention as claimed including an apparatus for treating a body comprising: a chamber 101; a sample holder 111 in said chamber designated to hold a wafer with a predetermined diameter; means 120 for introducing gas into said chamber; means for exhausting said gas in said chamber; a power supply 104 of ultra high frequency (500 MHz); a coil 102 located outside the chamber; an electromagnetic wave radiation antenna 107 coupled to said power supply and installed in an atmosphere; wherein said antenna 107 is a plate antenna (see figs. 1-2 and col. 5-line 3 to col. 7-line 3). Additionally, note that the antenna of the apparatus of Yokogawa et al. includes a discoidal electrode 107 to which the Ultra High Frequency is applied, an earth electrode 105, and a dielectric plate 106 which is provided between the discoidal electrode and the earth electrode.

Yokogawa et al. is applied as above but fails to expressly disclose that the antenna is located in an atmosphere different than the low vacuum in which the exhausting means is located and that a separation means is located between both locations. However, Yokogawa et al. discloses an apparatus in which the antenna is located in such a claimed atmosphere, that can be readily manufactured and maintained (see fig. 12 and col. 16-line 15 to col. 17-line 10). Therefore, in view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the embodiment disclosed in fig. 1, as to locate the antenna as shown in the embodiment of fig. 12 of Yokogawa et al., because in such a way the apparatus can be readily manufactured and maintained.

Regarding the diameter of the discoidal electrode being not less than that of the wafer, such limitation is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses which do not further limit, and therefore, do not patentably distinguish the claimed invention. The apparatus of Yokogawa et al. is capable of processing a wafer having a diameter less than the diameter of the discoidal electrode.

With respect to claim 4, official notice was taken with respect to the well known use of showerheads for uniform distribution of gases in the office action mailed 5/22/01, and therefore this limitation is taken to be admitted prior art.

With respect to the claimed distance between the showerhead and the substrate holder, such limitation is considered to involve routine optimization which has been held to be within the level of ordinary skill in the art. Therefore, one of ordinary skill in the art at the time the invention was made would have modified Yokogawa et al. by having a distance between the gas introduction means and the substrate holder of 100 mm in order to optimize the apparatus and the process being performed in the apparatus.

Furthermore, Yokogawa et al. states that the size of the circular conductive plate is set to a diameter in which a specific resonance mode of the electromagnetic wave can be obtained (col. 5, lines 33-36). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the size of the conductive plate as to obtain the desired claimed resonance mode of electromagnetic waves, as to optimize the apparatus and/or the process performed in the apparatus.

Claims 9 and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., EP 0,779,644 A2 in view of Nakano et al., U.S. Patent 6,155,202.

Yokogawa et al. is applied as above but does not expressly disclose that the power supply is provided in the form of a cone, but it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. as to provide the power supply in the form of a cone because, as disclosed by Nakano et al., better power consumption efficiency and optimization of the film being formed results (see col. 11-lines 40-45 and fig. 16 and its description).

Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokogawa et al., EP 0,779,644 A2 in view of Li et al., US 6,009,830 or Fairbairn et al., US 5,614,055.

Yokogawa et al. is applied as above but does not expressly disclose the use of a gas shower plate which its diameter is less than or equal to $\frac{3}{4}$ of the diameter of the wafer. Li et al. discloses an apparatus in which a gas shower plate is used as the gas introducing means. Furthermore, the reference clearly discloses that the showerhead is smaller in diameter than the wafer being processed (see, for example, figs., 1-2, and their descriptions, and col. 3, lines 43-50). Additionally, Fairbairn et al. discloses an apparatus in which a gas shower plate is used as the gas introducing means, wherein the shower plate is smaller in diameter than the wafer being processed (see, for example, fig. 4 and its description). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. as to comprise a shower plate, as taught by Li et al. or Fairbairn et al., because in such a way the gas is uniformly distributed into the apparatus and it is more efficiently and effectively directed and concentrated towards the wafer being processed. Furthermore, the limitation of the gas shower plate having a diameter less than or equal to $\frac{3}{4}$ of the diameter of the wafer, is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses which do not further

limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Yokogawa et al. modified by Li et al. or Fairbairn et al. is capable of processing a wafer having a diameter bigger than the shower plate, as claimed.

(10) Response to Argument

Appellant argues that the specification, as originally filed, provides support for the limitation of a dry etching apparatus wherein the antenna includes a discoidal electrode to which Ultra High Frequency is applied, an earth electrode and a dielectric plate provided between the discoidal electrode and the earth electrode. Appellant cites page 6, lines 27-30 of the instant application, as well as page 1 with reference to fig. 2 of the instant application, as support for such limitation. However, the examiner kindly disagrees since the specification, as originally filed, does not provide support in page 6, lines 27-30 for the instant limitation. Furthermore, it should be noted that: a) page 1 of the instant application describes the apparatus of the prior art (fig. 2); b) the discoidal electrode 1 shown in figure 2 (prior art) does not necessarily have to be the same as reference number 1, as shown in figure 1 (the instant invention); c) one of ordinary skill in the art would not realize that the discoidal electrode of fig. 2 (prior art) is the same as the discoidal electrode of fig. 1 (the instant invention); and d) there is no disclosure in the specification, as originally filed, that the discoidal electrodes of figures 1 and 2 are the same. Additionally, appellant contends that US Patent 5,891,252 provides support under 35 USC 112, first paragraph, for the claimed electrode structure, since such reference was incorporated by reference in the specification of the instant application.

However, it should be noted that the apparatus claimed in the '252 patent is not the same apparatus as the apparatus disclosed and claimed in the instant claimed invention, and furthermore, "To incorporate material by reference, the host document must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the various documents." *Id.* at 1282, 54 USPQ2d at 1679, citing *In re Seversky*, 474 F.2d 671, 674, 177 USPQ 144, 146 (CCPA 1973), and *In re Sanders*, 444 F.2d 599, 602-603, 170 USPQ 213, 216-17 (CCPA 1971). Since the specification, as originally filed, fails to identify with detailed particularity that the electrode structure is being incorporated by reference from the US Patent 5,891,252 reference, the instant application fails to provide support under 35 USC 112, first paragraph, for the claims in the rejection detailed above. Therefore, the rejection under 35 U.S.C. 112, first paragraph is respectfully maintained.

Appellant argues that the Yokogawa apparatus fails to disclose the antenna as claimed. The examiner respectfully disagrees with such an argument since, as stated in the final rejection, the Yokogawa reference discloses an electromagnetic wave radiation antenna that includes a discoidal electrode 107 to which an Ultra High Frequency is applied, an earth electrode 105, and a dielectric plate 106 which is provided between the discoidal electrode and the earth electrode.

Appellant argues that the Yokogawa reference does not disclose the claimed relationship between the wafer diameter size and the discoidal electrode diameter. However, as stated in the final rejection, regarding the diameter of the discoidal electrode being not less than that of the wafer, such limitation is directed to a method

limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses which do not further limit, and therefore, do not patentably distinguish the claimed invention. The apparatus of Yokogawa et al. is capable of processing a wafer having a diameter less than the diameter of the discoidal electrode.

In response to appellant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Appellant argues that in the second embodiment of Yokogawa (Fig. 5), the plate 208 is not equivalent to that of the invention. The examiner respectfully wants to point out that the second embodiment (Fig. 5) of the Yokogawa reference has not been relied upon for the rejections of the instant claimed invention.

In response to appellant's arguments against the Yokogawa embodiments individually (the antenna is not a plate antenna in the embodiment of Fig. 12), one cannot show nonobviousness by attacking the embodiments individually where the rejections are based on combinations of the embodiments. See *In re Keller*, 642

F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It should be noted that the embodiment of Fig. 12 of the Yokogawa reference is not relied upon to show a plate antenna since the embodiment of Figs. 1-2 (main embodiment) already discloses the claimed characteristic. The embodiment of Fig. 12 is used for the teaching of locating the antenna outside the chamber since such arrangement will provide an apparatus that is readily manufactured and maintained.

Appellant argues that the Yokogawa reference does not disclose resonance in the TM₀₁ mode. However, as stated in the final rejection, Yokogawa et al. states that the size of the circular conductive plate is set to a diameter in which a specific resonance mode of the electromagnetic wave can be obtained (col. 5, lines 33-36). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the size of the conductive plate as to obtain the desired claimed resonance mode of electromagnetic waves, as to optimize the apparatus and/or the process performed in the apparatus.

With respect to the claimed conical-shaped feed division, appellant argues that the Yokogawa reference does not disclose a conical-shaped feed division that is placed on the discoidal electrode and that the electrode disclosed by Nakano is used in an apparatus placed in a vacuum. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re*

Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Appellant argues that Li et al. or Fairbairn et al. do not disclose or appreciate the importance of the shower plate diameter with respect to the wafer diameter so that the processing could be carried out without the in-plane difference of the CD gain. However, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Furthermore, it should be noted that both Li et al. and Fairbairn et al. Li et al. disclose an apparatus in which a gas shower plate is used as the gas introducing means and wherein the shower plate is smaller in diameter than the wafer being processed. Additionally, the Li et al. reference clearly discloses that the diameter of the showerhead is less than $\frac{3}{4}$ the diameter of the wafer (note that the reference clearly discloses that the diameter of the shower plate is 112 mm and the diameter of the wafer is 200 mm, which clearly discloses that the diameter of the shower plate is $\frac{3}{4}$ or less the diameter of the wafer), see, for example, figs., 1-2, and their descriptions, and col. 3, lines 43-50. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Yokogawa et al. as to comprise a shower plate, as taught by Li et al. or Fairbairn et al., because in such a way the gas is uniformly distributed into the apparatus and it is more efficiently and effectively directed and concentrated towards the wafer being processed. Furthermore, the limitation of the gas shower plate having a

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diameter less than or equal to $\frac{3}{4}$ of the diameter of the wafer, is directed to a method limitation instead of an apparatus limitation and since an apparatus is being claimed as the instant invention, the method teachings are not considered to be the matter at hand, since a variety of methods can be done with the apparatus. The method limitations are viewed as intended uses which do not further limit, and therefore do not patentably distinguish the claimed invention. The apparatus of Yokogawa et al. modified by Li et al. or Fairbairn et al. is capable of processing a wafer having a diameter bigger than the shower plate, as claimed.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,


Luz Alejandro

February 16, 2006

Conferees:


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